CHAPTER 3
POWER DISTRIBUTION AND UTILIZATION

3-1. Distribution equipment. Distribution equipment will provide adequate capacity for the loads to be served (para 2-4*c*). Equipment will have adequate interrupting capacity for the duty encountered, and will be capable of safely withstanding the short-circuit stresses produced by the supply system. Wherever practicable, time-current characteristics of protective devices will be fully selective and coordinated so that the protective device nearest the fault will function first.

a. Switchgear and switchboards. Switchgear and switchboards will be of the dead-front, floor-mounted, free-standing, metal-enclosed type utilizing circuit breakers or fusible switches as circuit protective devices. Space-only cubicles and appropriate bus provisions will be installed for future protective device additions, as necessary to accommodate designed load growth.

b. Panelboards. Distribution panelboards will be of the wall-mounted, dead-front type, either circuit-breaker or fusible-switch-equipped. Branch-circuit panelboards will be of the wall-mounted, dead-front type, equipped with circuit breakers. Loadcenter panelboards will be used only where eight or fewer circuits are supplied therefrom and where light duty can be expected, except as authorized for military family housing.

3-2. Utilization equipment.

a. Motor controllers. Motor controllers normally will be of the magnetic, across-the-line type, except that for motors with starting kVA that will result in more than a 30 percent transient voltage dip, controllers will be of the reduced-voltage or current-limiting type. Manual controllers may be used within the limitations imposed by the NEC, where appropriate. Motor control centers having disconnect devices, branch-circuit overload protection and controllers mounted in a single assembly may be used where several motors are grouped in a particular area, as in mechanical equipment rooms. Control-circuit voltages will not exceed 150 volts to ground. In grounded-neutral systems, the neutral conductor will be directly connected to the starter coils. Where control power transformers (CPT) are used, the grounded leg of the CPT will be directly connected to the started coils.

b. Motors. Motors will have mechanical and electrical characteristics suitable for the conditions encountered. Generally, motors of more than 1/2 horsepower rating will be polyphase when such service is available. Smaller motors will be single-phase. Motor voltage rating will be suitable for the voltage supplied. The use of 230-volt motors on 208-volt systems will be avoided.

3-3. Wiring systems. Generally, wiring systems will consist of insulated conductors installed in metal raceways, except that in combustible construction branch-circuit wiring may consist of metal-clad or mosture- and corrosion-resistant nonmetallic-sheathed cables installed in areas as permitted by the NEC. Raceways and cable will be concealed wherever practicable in finished spaces.

a. Feeders. Feeders will have an ampacity adequate for the loads to be served (para 2-4*c*). Demand factors applicable to feeder loads will be based upon the nature of the individual loads and their use characteristics. The following demand factors should normally be used, except where experience permits the use of other factors known to be satisfactory for a specific application:

– Lighting loads, continuous Use (offices, shops, etc.)	100 Percent
– Lighting loads, noncontinuous use (living areas, storage, etc.)	80 percent
– Convenience outlook loads, general use	60 percent
– Electric food service and preparation loads	65 percent
– Mechanical equipment loads, continuous use	100 percent
– Mechanical equipment loads, cyclic use	80 percent

b. Branch circuits. Branch circuits will be rated a minimum of 20 amperes, except where lesser ratings are required for specific applications. Branch circuit conductors will in no case be less than No. 12 AWG.

c. Voltage drop. The combined voltage drop on feeders and branch circuits will not exceed 5 percent, based upon the assumption that transformer load centers are located within the facility. Where such load centers are located exterior to the facility, the combined voltage drop for service conductors, feeders, and branch circuits will be limited to 5 percent. Individual voltage drop on feeder and branch circuits will not exceed the recommendations of the NEC.

d. Ground-fault circuit protection. Generally, ground-fault circuit protection will be provided as required by the NEC. Such protection will not be provided beyond those applications specifically required by the NEC except as authorized by HQDA(DAEN-ECE-E), WASH DC 20314, and for Air Force projects by HQ USAF/LEEEU, WASH DC.

e. Hazardous locations. Wiring systems in hazardous locations will conform to the NEC requirements for the particular hazard encountered. Project construction drawings will outline the extent of each hazardous location, describing the applicable vertical and horizontal limits of the hazards and identifying each hazardous location by NEC Class, Division, and Group. Designation of either specific maximum operating temperatures of equipment or temperature ranges will also be indicated.

(1) Where governing criteria are such that the need for sealing fittings is not clearly expressed, and differing interpretations of NFPA requirements could occur, sealing fittings will be provided, and project drawings will reflect that provision.

(2) Instances occur where military terminology is not expressed in terms consistent with the civilian sector. In such cases, the function to be performed will govern the requirement for hazardous locations design. As an example, repair shops in vehicle or motor maintenance facilities and self-help garages are normally considered hazaardous locations equivalent to commercial garages as concerns function. Accordingly, the NEC requirements for commercial garages will be followed for such a military-equivalent facility.

(3) Every effort will be made to locate electrical equipment in nonhazardous areas of facilities having hazardous locations. General exceptions to such a requirement are lighting fixtures in paint-spray booths and similar situations where electrical equipment must be located within a hazardous location due to financial requirements.

f. Raceway systems. Raceway sizes will not be less than 1/2 inch and will be based upon the use of moisture-resistant thermoplastic, moisture- and heat-resistant thermoplastic, or synthetic rubber insulated conductors. Raceway sizes greater than 1/2 inch nominal trade size will be indicated on the project construction drawings.

(1) Generally, raceways used for interior wiring systems will consist of rigid, threaded, zinc-coated steel conduit; intermediate metal conduit; or electrical metallic tubing. Limited use will be made of rigid aluminum conduit. Use of plastic conduit within structures will be limited to applications below concrete slab-on-grade construction and in highly corrosive, nonhazardous locations where metallic conduits will corrode due to atmospheric conditions.

(2) Flexible metal conduit will be used for permanent connections to large appliances, equipment, and motors where movement may be involved or where equipment vibration is of concern. Flexible metal conduit may also be used for lighting fixture connections above suspended ceilings in accordance with the NEC, and with Underwriters Laboratories approved and labeled equipment and control assemblies.

(3) Surface metal raceways or multi-outlet assemblies normally may be used only for building improvements or renovations, or for applications where a multiplicity of cord-and-plug connected equipment will be utilized in a limited space, such as in some areas of medical facilities and laboratories.

(4) Underfloor ducts may be used in large administrative or other areas where extensive power and communications facilities are required that cannot be adequately served by wall outlets normally provided. Ducts should have nominal cross-sectional areas of 3 square inches for power service and 8 square inches for communications service. Preset inserts should be provided on 24-inch centers. Ducts should be installed parallel to exterior walls, with the first row approximately 5 feet therefrom. Additional rows should be spaced on 8 foot centers. Junction outlet should be kept to a minimum, located at strategic points to facilitate wiring to panelboards or cabinets, and spaced not more than 50 feet apart.

(5) Busways or cablebus may be used for feeders and service entrances where more economical than equivalent-ampacity insulated conductors in raceways. Plug-in busways may be used in industrial or shop areas to serve a multiplicity of power outlets or motors.

(6) Cable trays may be used as a support system for–

- –Wiring methods that may be used without a tray such as metal-clad cable or conductors in conduit.
- –Multiconductor type cables such as UF or SE.
- –Single conductors where permitted by the NEC.

(7) Cellular steel floor may be used in large structures having extensive power, lighting, and communications wiring requirements where the combination of structural adequacy and raceway access capacity so provided will result in major economies as compared to conventional building systems. Where the use of cellular steel floor is anticipated, electrical and structural designs will be closely coordinated, beginning at the earliest practicable design phase.

(8) Branch-circuit wiring within lightweight, demountable, metal-stud partitions may consist of properly supported metal-clad cable or nonmetallic sheathed cable systems installed through nonmetallic

bushed or grommeted holes or slots in the framing members. Outlet boxes for such applications will be of metal, grounded by the cable grounding conductor, and securely supported by bar hangers or equivalent means between framing members.

(9) Mineral-insulated cable systems, type MI, may be used in lieu of exposed conduit and wiring. Cable connections and terminations will be made in accordance with the manufacturer's recommendations to assure proper operation.

(10) Conductors will be of copper for sizes No. 6 AWG and smaller. For sizes larger than No. 6 AWG, copper or aluminum conductors will be permitted as a contractor option. Conductor insulation will be suitable for the application and will conform to the NEC requirements for each application.